

On the occurrence of Eastern knapweed fritillary, *Melitaea ornata* (Lepidoptera: Nymphalidae) in Croatia

Toni Koren & Ana Štih

Abstract. The occurrence of *Melitaea ornata* Christoph, 1893 is confirmed for Croatia. The species was recorded in six localities in different regions of the country. All records originate from mountain areas or areas with strong mountain influence. Also, all specimens were recorded in May, which indicates the univoltinism of this species.

Samenvatting. Over het voorkomen van *Melitaea ornata* (Lepidoptera: Nymphalidae) in Kroatië
Melitaea ornata Christoph, 1893 wordt hier voor het eerst uit Kroatië vermeld. De soort werd er vastgesteld in zes lokaliteiten, vooral uit bergstreken of uit gebieden dichtbij bergen. Alle exemplaren werden in mei waargenomen, wat duidt op slechts één generatie per jaar.

Résumé. De la présence de *Melitaea ornata* (Lepidoptera: Nymphalidae) en Croatie
Melitaea ornata Christoph, 1893 est mentionnée ici pour la première fois de Croatie. L'espèce a été trouvée dans six localités dans ce pays, dans des montagnes ou des régions montagneuses. Tous les exemplaires ont été trouvés en mai, ce qui indique l'univoltinisme de cette espèce.

Key words: *Melitaea ornata* – Croatia – distribution – new records.

Koren T.: University of Primorska, Science and Research Centre, Institute for Biodiversity Studies, SI-6310 Izola, Giordana Bruna 6, Slovenia, E-mail: koren.toni1@gmail.com

Štih A.: Croatian Herpetological Society – Hyla, Prva Breznička 5a, 10 000 Zagreb, Croatia.

Introduction

The genus *Melitaea* comprises of about 65 small to medium sized butterfly species distributed widely across the Palearctic region (Leneveu *et al.* 2009). In Europe 15 species of the genus *Melitaea* occur (Van Swaay *et al.* 2010), of which eight are present in Croatia (Šašić & Mihoci 2011). In most cases, the European representatives of this genus have clearly visible external morphological characteristics and they can be easily distinguished from each other (Tolman & Lewington 2008). However, for some species complexes, like that of *Melitaea athalia* (Rottemburg, 1775), *Melitaea aurelia* (Nickerl, 1850) and *Melitaea britomartis* Assmann, 1847, an analysis of the genitalia is crucial for a correct identification (Koren & Jugovic 2012).

Another problematic species complex of the same genus is that of *Melitaea phoebe* (Denis & Schiffermüller, 1775). The nominate species, *M. phoebe*, is distributed from North Africa, across Europe, Turkey, and the Middle East towards Mongolia and China (Tolman & Lewington 2008). Recently, many subspecies of this *M. phoebe* from Europe and Asia were recognized as separate species, according to their common ecological characteristics, including their univoltinism, the red head capsule of L4 larvae and the preference to *Cirsium* or *Centaurea* host-plants (Tóth & Varga 2010). At first, some subspecies were assigned to *Melitaea telona* Fruhstorfer, 1908 (Tóth & Varga 2010), which later proved to be conspecific with *Melitaea ornata* Christoph, 1893, which is now the accepted name (Jakšić 2011, Tóth & Varga 2011, Tóth *et al.* 2013). The species status was proven by genital morphometry (Tóth & Varga 2011) and on the basis of mitochondrial and two nuclear genes (Leneveu *et al.* 2009). The current knowledge about the distribution of this species includes the southern part of the Italian peninsula, the Balkans, Hungary, Greece, Turkey and localized records in parts of western Asia (Tóth *et al.*

2012). Among the subspecies which were attributed to *M. ornata* is also *Melitaea phoebe nigrogyia* Verity, 1938 described from Opatija (Croatia) but only on the base of the literature description of the species (Tóth & Varga 2010). The presence of *M. ornata* in Croatia was also shown in the recent paper dealing with the current distribution (Tóth *et al.* 2012). In the paper, there are three points on the map showing the territory of Croatia, but its presence there was not addressed, and it is not known if the points originate from the literature or they represent new records (Tóth *et al.* 2012). Also, this species was not listed in the recent checklist of butterflies of Croatia (Šašić & Mihoci 2011). The aim of this paper is to report the new record of *M. ornata* for the territory of Croatia, and confirm its occurrence in the country.

Materials and methods

During the year 2012 we did an intensive survey of the butterfly fauna of Croatia. During that period special attention was given to the *M. phoebe* species complex. The specimens were collected with an entomological net and stored in a private butterfly collection (Koren in Pazin, Croatia). For each specimen basic data about the habitat were noted, as well as the geographic coordinates. Coordinates were taken using a Garmin e-Trex Vista device. Additionally, specimens from the first author's collection, collected between the years 2002–2011, were included in the analysis. The determination of the collected specimens was done using the determination key presented in Tóth & Varga (2011). To confirm the correct determination, genital slides were prepared using the standard preparation method, similar to that given by Tóth & Varga (2011). The abdomen of fresh specimens was cut, and left overnight in a 10% KOH solution. After that the genitalia were cleaned, mounted in Euparal and photographed.

Results and discussion

From all collected specimens only six individuals had the external characteristics according to which they could be identified as *M. ornata*. Localities in which the specimens were collected are shown in Fig. 1 and listed here:

1. Mt. Učka, Vela Učka, Istria, dry karstic grassland, 45.305554, 14.205031, 30.v.2002.

2. Gorjani Sutinski, near the church Sv. Jakob, Mt. Strahinšćica, wet meadow, 46.177722, 15.947750, 20.v.2012.

3. 1200 m E from Gorjani Sutinski, Mt. Strahinšćica, wet meadow, 46.180250, 15.964833, 20.v.2012.

4. Vugrovec, Mt. Medvednica, wet meadow, 45.874578, 16.108326, 24.v.2010.

5. Zrmanja Vrelo, Zrmanja river, wet meadows 1 km south from the river spring, 44.203035, 16.070720, 1.v.2012.

6. Road toward village Velji Do, Mt. Sniježnica, dry karstic grassland, 42.550942, 18.354265, 2.v.2012.



Fig. 1. Distribution of *M. ornata* in Croatia.

1. Mt. Učka, Vela Učka,
2. Gorjani Sutinski, near the church Sv. Jakob, Mt. Strahinšćica,
3. 1200m E from Gorjani Sutinski, Mt. Strahinšćica,
4. Vugrovec, Mt. Medvednica,
5. Zrmanja Vrelo, wet meadows 1 km south from the river spring,
6. Road towards village Velji Do, Mt. Sniježnica.

There are several external characteristic on which it is possible to distinguish adults of *M. ornata* from *M. phoebe* (Fig. 2): the triangular shaped lunules on the underside of the fore-wing; the disconnected, triangular shaped lunules in the marginal region of the hind-wing; the broader and elliptic antennal club (Tóth & Varga 2011). The most important difference between male genitalia of *M. phoebe* and *M. ornata* is the depth of the central notch of the saccus in *M. ornata* (Fig. 3), as well as the more symmetric shape of the posterior processes (Tóth & Varga 2010). With all these in mind we can conclude that the collected specimens belong to *M. ornata* rather than *M. phoebe*. Three specimens collected in the year 2012, as well as three specimens from the private collection, were determined as *M. ornata*. In the same localities more specimens of *M.*

phoebe were observed and collected, which shows that these two similar species are sympatric in the area.

Ecology

All specimens were collected in May, which is in agreement with the univoltine appearance of *M. ornata* in comparison with *M. phoebe* (Tóth & Varga 2010). Five records were recorded in a mountain zone (Mt. Učka, Mt. Medvednica, Mt. Strahinšćica and Mt. Sniježnica), while the record from Zrmanja Vrelo can also be considered as such. The area of Zrmanja spring is under an interesting climatic inversion, which allows some butterflies species, which are usually present on higher altitudes, to live there (Koren *et al.* 2011). All the specimens, except the ones from Mt. Učka and Mt. Sniježnica were collected in wet meadows.

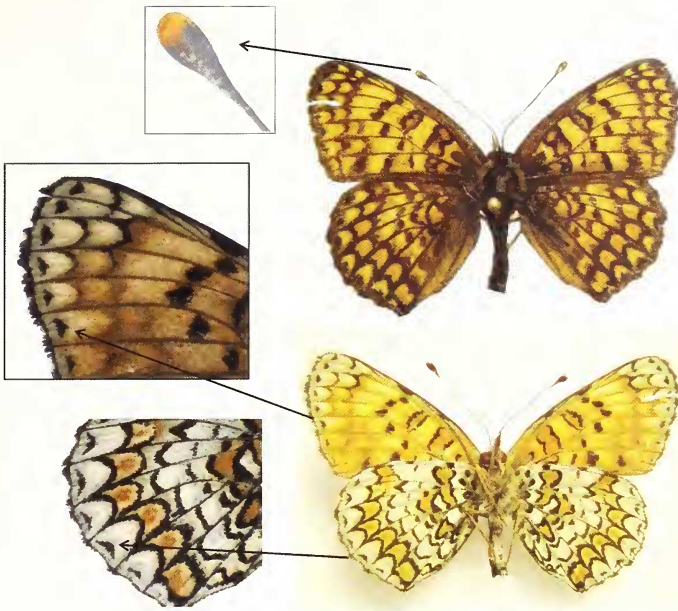


Fig. 2. *M. ornata* Christoph;
1893 from Mt. Strahinšćica,
Croatia.



Fig. 3. Male genitalia of
Melitaea ornata Christoph,
1893 from Mt. Strahinšćica,
Croatia.

Distribution in Croatia

Our data show that *M. ornata* is present in almost whole Croatia. Records originate from Istria, toward Mt. Medvednica and northern Croatia. The record from Zrmanja lies on the border between Lika and Dalmatia, while the record from Mt. Sniježnica belongs to the southern Dalmatia. The occurrence of this species in Croatia was previously noted only on the distribution map in Tóth *et al.* (2013) but without any mention of their origin, or with any exact locality. In the light of that,

our records are the first exact findings of this species in Croatia.

Conclusions

The distribution of the Eastern knapweed fritillary in Croatia is still far from known. Our records indicate that the species is present in the whole country, but probably is more common in the mountainous areas. More records of this species in Croatia, as well as in neighbouring areas are to be expected in the future. With this record, the butterfly fauna of Croatia consists of 196 species (Šašić & Mihoci 2012).

References

- Jakšić P. 2011. Butterfly species (Lepidoptera: Hesperioidea and Papilionoidea) new to the Serbian fauna. — *Biologica Nyssana* **2**(1): 45–50.
- Koren T., Bjelić M., Božinovska E., Štih A. & Burić I. 2011. Contribution to the knowledge of butterfly fauna (Lepidoptera: Rhopalocera) of Zrmanja River region, Croatia. — *Acta Entomologica Slavonica* **19**(2): 155–168.
- Koren T. & Jugović J. 2012. New data on the presence of three similar species of the genus *Melitaea*: *M. athalia*, *M. aurelia* and *M. britamartis* (Lepidoptera: Nymphalidae) in the north-western Balkans. — *Annales, Series Historia Naturalis* **22**(1): 25–31.
- Leneveu J., Chichvarkhin A. & Wahlberg N. 2009. Varying rates of diversification in the genus *Melitaea* (Lepidoptera: Nymphalidae) during the past 20 million years. — *Biological Journal of the Linnean Society* **97**: 346–361.
- Šašić M. & Mihoci I. 2011. Annotated checklist of Croatian butterflies with vernacular names. — *Natura Croatica* **20**(2): 425–436.
- Tolman T. & Lewington R. 2008. *Butterflies of Britain & Europe*. — Harper Collins Publishers, London, 384 p.
- Tóth J. P. & Varga Z. 2010. Morphometric study on the genitalia of sibling species *Melitaea phaebe* and *M. telana* (Lepidoptera: Nymphalidae). — *Acta Zoologica Academiae Scientiarum Hungaricae* **56**: 273–282.
- Tóth J. P. & Varga Z. 2011. Inter- and intraspecific variation in the genitalia of the '*Melitaea phaebe* group' (Lepidoptera, Nymphalidae). — *Zaagischer Anzeiger – A Journal of Comparative Zoology* **250**: 258–268.
- Tóth J. P., Varga K., Végvári Zs. & Varga Z. 2013. Distribution of the Eastern knapweed fritillary (*Melitaea ornata* Christoph, 1893) (Lepidoptera: Nymphalidae): past, present and future. — *Journal of Insect Conservation* **17**(2): 245–255.
- Van Swaay C., Cattelod A., Collins S., Maes D., Lopez Munguira M., Šašić M., Settele J., Verovnik R., Verstraet T., Warren M., Wiemers M. & Wynhof I. 2010. *European Red List of Butterflies*. — Luxembourg: Publications Office of the European Union.